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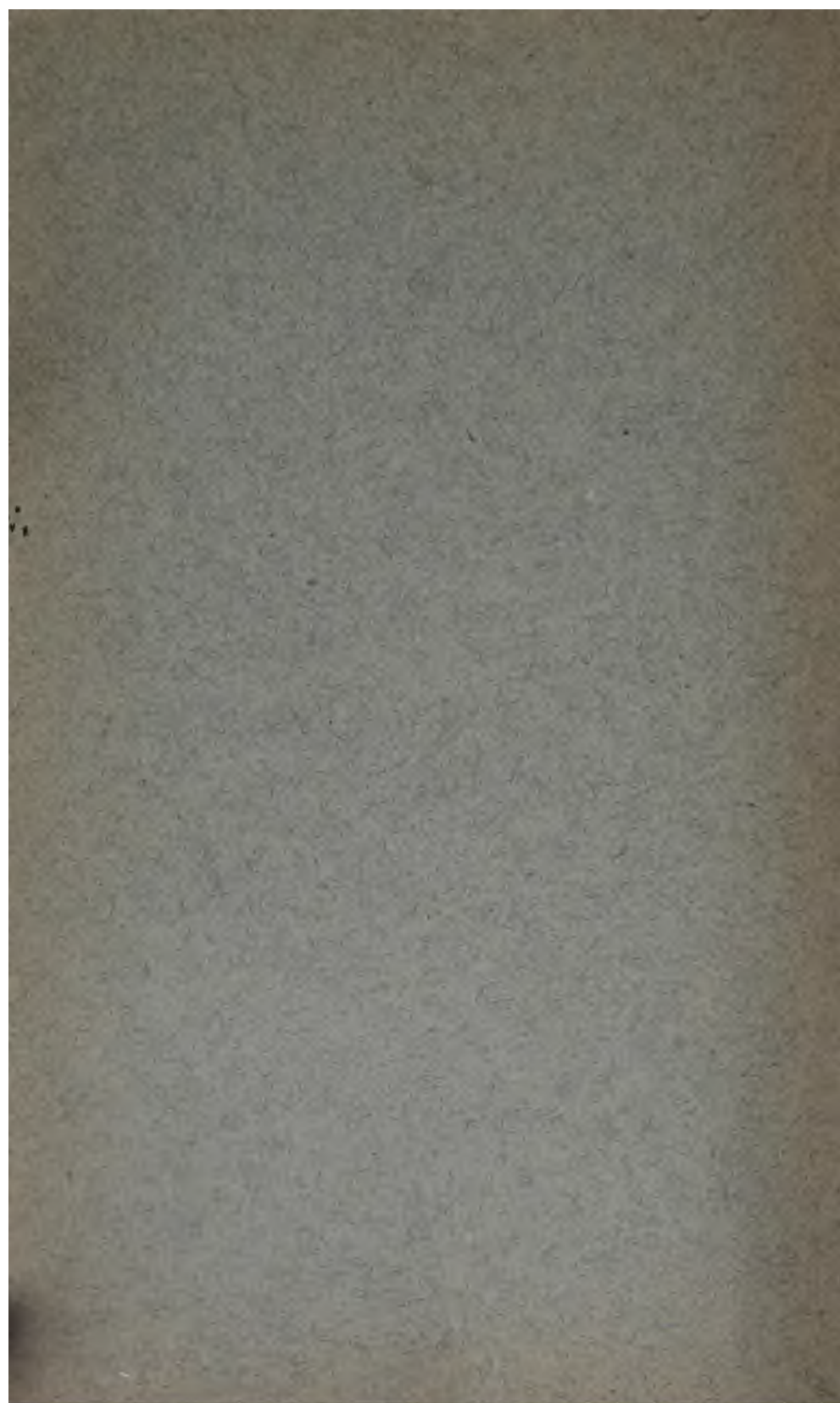
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Columbia University
in the City of New York.

UNIV. OF MICH.
SEP 8 1908

THE STUDY
OF
ARCHITECTURAL DRAWING
IN THE
SCHOOL OF ARCHITECTURE.

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THE INSTRUCTION IN ARCHITECTURAL DRAWING AT COLUMBIA UNIVERSITY.

By PROFESSOR WILLIAM R. WARE.

THE drawing done by an architect lies midway between that of the artist and that of the engineer, being controlled partly by considerations of fact and partly by regard for the appearances of things; partly by geometrical conditions, and partly by the skill and judgment of the draughtsman. In executing them he is accordingly at once an artist and a mathematician. He handles his instruments of precision, his T-square, triangle and dividers, with as free a touch as the painter his pencils and brushes, and on the other hand subjects his free-hand work to a constant process of reasoning and measuring, and though without scale or compasses, never lets his Euclid go out of his mind.

Of these two procedures we give precedence in time and in importance to the last. We begin, to be sure, with the use of mathematical instruments, so as to establish at once a certain standard of exactness. But we discontinue their use as soon as possible and find every advantage in doing everything free-hand until most things are done. For the draughtsman who has been trained only with the dividers and ruling-pen, however skilful he may become, is as helpless when they are not at hand as he was before he began to learn their use, while the man who can do whatever needs to be done without them has no difficulty in doing it with them. They come to him then as helps and auxiliaries, which is what they should be, not as necessities. He is thus saved that early experience of anxiety and caution in their use which produces a hard and timid drawing at the hands of a hard-fisted and merely mechanical draughtsman.

Mechanical drawing being thus eliminated, as a special branch of study and discipline, and left to be taken up when occasion requires, and when it will present no difficulty, what remains falls naturally under half a dozen different heads—Tracing, Copying, Graphical Construction, Graphical Discussion, Pen-work, Brush-work, Out-door Sketching and the Study of the Orders. Under all of these, as in all endeavor, there are to be recognized the two elements, familiar in the Latin Grammar as the object or end, and as the manner, means and instrument by which the end is to be at-

6 INSTRUCTION IN ARCHITECTURAL DRAWING

tained. There is the definite conception of the form to be depicted, which is the intellectual and imaginative element—and there is the skill in execution by which the disciplined eye and hand are enabled to realize this conception. The draughtsman has first to get a clear idea of the shapes to be delineated, and then has to compel his hand to the adequate representation of it.

These are in their nature two separate tasks, and for beginners to attempt them both is, in general, and in the case of all but a few specially gifted persons, too much to undertake at once. We accordingly treat them separately. This is effected by beginning the study of draughtsmanship with Tracing.

I. TRACING.

In Tracing, which is drawing upon transparent paper laid over the "copy," the question what to do does not arise, since there is no uncertainty as to the size, shape or position of the lines to be made. Substantial accuracy of form is secured in advance, and it would seem as if a merely mechanical fidelity would suffice to produce a *fac-simile*. But in a work of art, every line, besides shape and position, has a spirit and character of its own, and to seize and reproduce this is enough to occupy the beginner's best attention. Even when, as is generally the case, a line needs to be perfectly even and uniform from end to end, and as it were, to possess no individuality of expression at all, this negative character is one which it requires care to secure. The tracing paper thus relieves the student of responsibility for one-half his task, only that he may devote himself the more efficiently to the other half. At the same time the lines beneath his paper secure him from disaster, and this assurance gives him confidence and courage to attack the task which remains, a task which after all comprehends the main substance of the matter. For in the practice of tracing we require that the forms shall be as fully analyzed as if they were to be drawn from memory, and the lines made of as fine a quality as the student can command, and with as much purpose as if the work were a work of original design. Instead of crawling along the line, as a child works with his Transparent Slate, our men are taught to trace with the same animation and spirit as if the original were not immediately under their hand. They soon find that a tracing may be as brilliant and effective as a copy. The only difference is that there is greater facility and boldness in the procedure and more accuracy in the result. (Plate I.)



PLATE I. TRACING FROM PHOTOGRAPH.
(Reduced in size about one-third.)

B. W. M.

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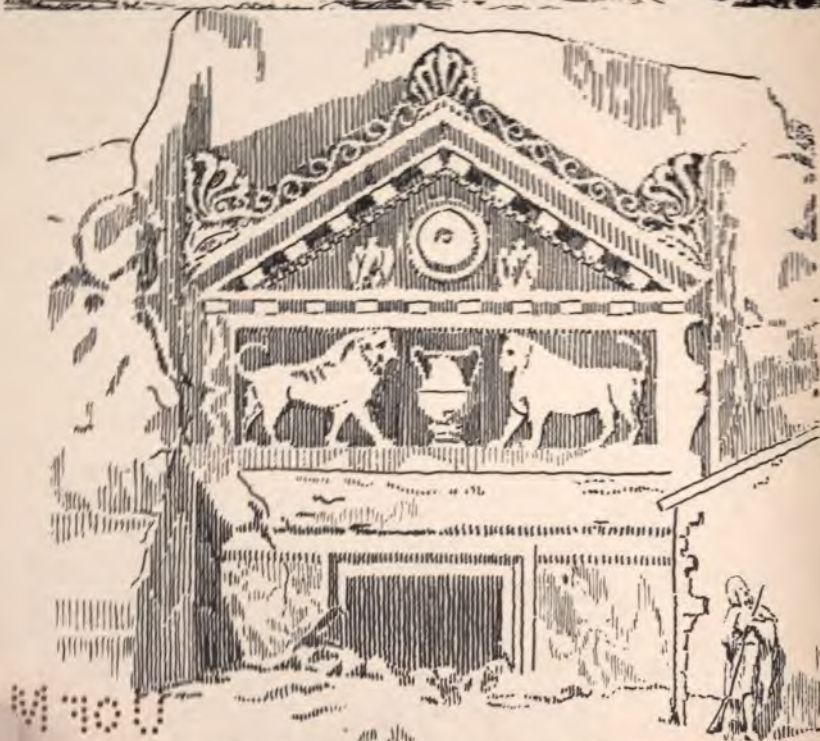
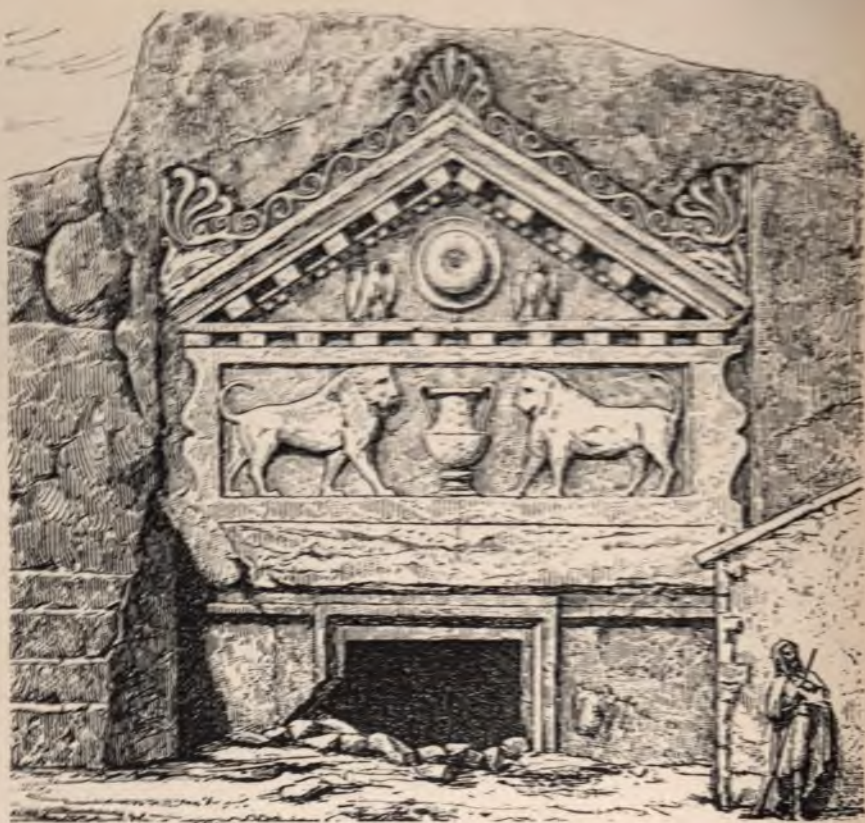


PLATE II. TRACING FROM A WOOD CUT. W. D. A.

In Illustration of the History of Architecture.

(About the size of the originals.)

This sort of tracing exacts the closest care and attention. It trains the hand, gives acquaintance with form, and teaches just what it is important to do and what it will do to leave undone. Thought and feeling are indeed so far from being replaced by a dull mechanical procedure, that they are, on the contrary, made only the more intelligent and sensitive by being concentrated upon a limited task.

Most of this work is done with the pen, pencil-marks upon tracing-paper being neither distinct nor durable. The outlines of course are traced, from prints or photographs, just as they are found. But the shading, even in the case of wood-cuts, is not textually reproduced, the forms of the shades and shadows being rendered by a series of flat tints. These are sometimes put in with the brush, but more often with the pen, parallel vertical lines being employed just as in drawing. This work is indeed, both in the outline work and in the shading, an admirable introduction to draughtsmanship with pen or pencil. The brush is in constant use, however, in making tracings of examples of colored decoration from prints of Egyptian tombs, Greek vases, or tiles and terra cotta of every period. The outlines are then sometimes drawn with the pen and filled in with color, which is often laid on the other side of the paper. But these may be dispensed with and the tracing made with the brush altogether. This is particularly effective in tracing anthemions and honeysuckle work from Greek vases, and in this work Japanese brushes prove specially serviceable.

These exercises are immediately utilized in the service of the historical studies which compose a chief part of our course. While practicing the essential principles of draughtsmanship in making tracings from drawings, engravings and photographs, our students are at the same time accumulating valuable memoranda for future reference. The tracing books in which this work is stored away become, before the end of the course is reached, a priceless possession. (Plate II.)

To this end we have accumulated a considerable mass of material illustrative of Architectural History. Part of this is of the nature of a gigantic scrapbook, and consists of innumerable portfolios full of prints and engravings, picked up at random as chance may offer, and mounted on cardboard for safer handling. But the chief part and the most useful part of this collection consists of the plates of standard architectural works mounted in like manner. Plates

which in a bound volume can be used by only one student at a time are thus made simultaneously accessible to a hundred.

There would seem to be no reason why this procedure should not be equally serviceable in any school. While learning to draw in the most efficient way, classes in Geography, Natural History, and Physics, could easily accumulate an invaluable illustration of the matters in hand.

II. COPYING.—OUTLINES AND SHADING.

The training of hand and eye, which result from these exercises in Tracing, prepare the student to copy with accuracy and intelligence whatever forms may come before him, whether presented in the flat or in the round, so far at least as concerns the mere execution of the lines. Tracing makes him acquainted with a variety of forms and the way of presenting them, and enables him to delineate them with a firm and workmanlike touch, but it affords of course no practice in the determination of shapes and sizes, and of the proportions and relative positions of the objects to be drawn. In copying, however, whether one is drawing from the round or from the flat, this determination of the outline is one's first concern. But it is so difficult a matter that it engrosses all one's attention, and it is well accordingly for the beginner to defer copying until, as thus by the practice of tracing, some manual dexterity and some critical appreciation of form have been acquired.

The accuracy of observation and quick sympathy of hand and eye needed accurately to reproduce the contours set before them, come to some persons as a natural endowment, while others can acquire them only by long and laborious practice. To such persons the exercises in Graphical Construction, described in some later paragraphs of this paper, are of special service. Like the preliminary surveys of an engineer, they serve to fix certain landmarks and enable him to block out his work. But it is not necessary, in copying drawings, photographs and prints at least, to put off the achievement of work really worth achieving upon subjects really worth working upon, until this skill in drawing outlines has been attained. For the student who is skilled in tracing is in a position to avail himself at once of the devices of transferring and squaring, and of the pentagraph and camera lucida, mechanical aids to which artists habitually resort to secure accuracy of form, but which, though they are by no means wholly mechanical, it is somewhat the custom of the schools to neglect, or even to disparege.

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PLATE III. BRUSH-WORK FROM PHOTOGRAPH AND FROM DRAWING, THE OUTLINES

In Transferring, the outline is first traced, then gone over with a soft pencil or charcoal on the other side of the tracing-paper, and then transferred to the paper on which the drawing is to be made by going over it a third time. It then, of course, has to be drawn a fourth time, more carefully still. This repetition affords in itself a valuable discipline.

In Squaring, a rectangular network of lines—threads, wires or pencil marks on tracing-paper—is laid over the original, a similar network is drawn on one's paper, and then the outline is copied one square at a time. A task which is a hundred times too difficult to undertake may thus, if divided into a hundred separate undertakings, be brought within the reach of powers still undeveloped. Each square presents simple lessons of its own which are just as instructive as if it were not part of a whole, and they may be made more instructive still if the second network is laid out to a larger or smaller scale than the first, so that the drawing is reduced, or, still better, enlarged, in size. (Plate III.)

It is one of the advantages of drawing from the flat that it makes the beginner, while slowly acquiring the judgment and skill which shall enable him at last to dispense with these helpful devices, to push on immediately to other equally important matters, such as the study of light and shade, modelling, values, and the relations of things. It thus opens to him the whole world of representative art as a field of endeavor instead of confining him, as drawing from the object must otherwise confine him for a long time, to forms which, if they are simple enough to come within the capacity of his hand, are likely to be too simple to satisfy the desires of his mind, such as cubes, pyramids and cylinders.

The Pentagraph answers the same purpose. It is by no means an automatic machine, and like tracing, requires to produce a good result all the draughtsmanship one has at command. The same is to be said of the Camera Lucida, the manipulations of which are a little more difficult, and which for objects in the round renders the draughtsman a somewhat similar service.

But the outline gives the form of an object in only two dimensions. The third dimension can be shown only by shading, which by representing the play of light and shade within the outline indicates the modelling of the surface. Completely to convey all the delicate gradations of tone which the practiced artist learns to perceive, requires the delicacy of touch which only the long

practice of the studio can give. This is so much beyond the skill of the beginner that in all schools of drawing the beginner is warned not to attempt it, and is instructed, in treating his lights and shades, to confine his attention to the main masses. He is told to simplify his task by dividing the surface into a certain number of fields, each of which may be regarded as virtually a plane surface, more or less exposed to the light, and may accordingly be represented by a flat tint of the proper grade. This compels a discriminating study of the form to be depicted and at the same time diverts attention from unimportant points of detail.

The subdivisions may be few or many, according to the scale of the drawing and the amount of detail which it is desired to render. Careful discrimination is needed, of course, to get them all of the right shape and size, and of the right tone, or, as the artists say, of the proper *value*. The more numerous the planes, the more delicate the analysis and the more subtle the differences. Objects in the sunlight, if drawn upon a small scale, may be effectively represented, as we have seen, by rendering the whole of the dark or shaded side by a single uniform tint. But whether the subdivisions are few or many, each is shown as a plane. They give, of course, only an approximation to the real form, but the approach may be made as close as one chooses by increasing their number. (Plate IV.)

But just as, when we take up free-hand work in preference to mechanical drawing, we nevertheless begin with a little work with the T-square and compasses, so as to establish a certain standard of accuracy, so here we find it best to let the students begin by trying their hand at the representation of rounded surfaces by graded tints. The real facts in regard to the gradations of shadow are thus brought to their notice, and their observation quickened, while their inevitable failure to reproduce the facts, and the unworkmanlike appearance of their work, convinces them, as nothing else would, that a more conventional method of treatment is more within the range of their powers and promises a more satisfactory result.

The skill and dexterity of hand required faithfully to represent these planes is only the skill to produce with the pen or pencil a flat tint of any depth, and this is of comparatively easy attainment. A few hours' practice in making straight parallel lines close together suffices to meet all the demands which a beginner's knowledge makes upon his skill. Stippling, cross-hatching, or the making of

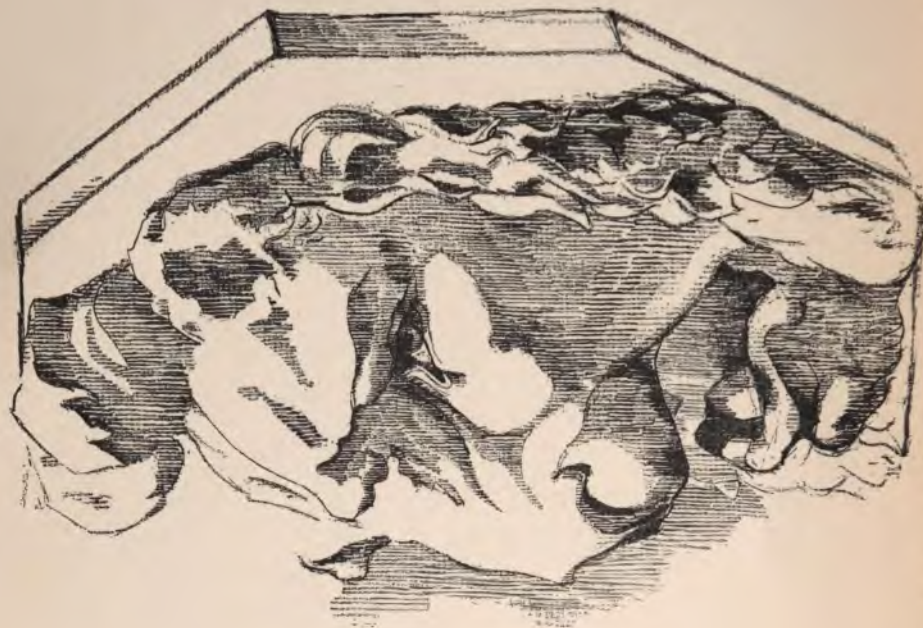




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PENCIL-WORK FROM LITHOGRAPH BY JULLIEN. LION'S HEAD BY JEAN GOUJON, FROM THE HOTEL CARNAVELET. W. T.
(The lithograph reduced in scale about three-quarters, the drawing about one-half.)

W. T.



ART IN THE GRADES AND THE TEACHER

grades and will include lines straight or curved such as are to be observed in the photographs attached as examples. In every drawing in schools that best be referred to a later period. They divert attention from the opportunities to be represented in terms and devices of representation. (Page 11)

There is moreover something in the same advantage to be found in the employment of such a single line of stroke in making that there is nothing of a single line in such as the result of a mass of scripping out the instrument in the hand. Thus the possibilities of expression under such a controlling effect which a native scripper gives prompt character to all the possibilities within reach. In so doing it does not become a certain kind of effort characteristic of the system under but with a more important by long and continuing the practice of the means of the employed apparatus means can being varied in this way which means a large increase in the effect. The drawing instrument is in any case a task for the teacher's beginners. (Page 12)

The treatment of questions of drawing and expressing a good result are reached almost from the first. It is the special merit of this system that with care and attention from the child's hand can produce fairly good results in drawing. What is desired of the draughtsman however is that he should draw with a good work almost automatically that is to say with a line that is clean, while his attention is mainly directed to the shape and size. But this mastery must come only by much more practice than two or three hours a week afford. The practice of the child in the preparation of daily exercises. Each member of every language classes hands in every week five pencil exercises, drawing either with him a little pad of smooth paper for the purpose. Exercises of objects or drawings from memory are sometimes prescribed but for the most part the nature of the work—perhaps the shades and shadows are interesting—and the teacher's chief purpose. They take from the child a considerable amount of time which might otherwise be wasted and in fact they tend to encourage the use of the drawing instrument for the purpose to advantage. (Page 13)

These simple means of drawing are not only the straight or curved with a few lines and the drawing of figures of any required degree of detail. The drawing of the human figure are without individuality of form and color and the drawing

that of being easy to learn. They are easily adjusted to the student's state of advancement and to the degree of completeness desired. They compel a careful study of form, since what is once done is done once for all, without expectation or intention of re-touching, and they fix attention upon the main masses of form and of light and shade, the representation of unimportant details being impossible. Moreover the result, however incomplete, is good as far as it goes, and is sure to be clean and bright, not woolly or muddy, as the shaded drawings of beginners are apt to be. It is also eminently suited to the architect's convenience, employing the lead pencil, which is *par excellence* the architect's weapon, and dispensing with the cumbersome and untidy apparatus of charcoal, crayons, stumps and "sauce," a paraphernalia which requires a habitat of its own and is out of place among the books, photographs, and drawings among which an architect lives.

There is at any rate a great saving of time and trouble in making the lead pencil do all it can. It certainly suffices to teach observation, analysis, delicacy of touch, firmness of hand, the importance of minding the masses and the values, knowledge of form and the sources of artistic expression. When the student has learned how to employ this medium it is soon enough to undertake the more difficult manipulations of charcoal and crayon, and at that stage of progress, which our men reach toward the end of their second year, these manipulations are easily learned. But the method under consideration is even better suited to the pen than to the pencil, since it almost precludes blots. In the third year the pen takes the place of the pencil in the rendering of every kind of subject, landscape, buildings, ornament and the human figure. (Plate VII.)

It is moreover eminently a system of interpretation and translation, rather than of the precise imitation of the object copied. In this respect it imparts to drawing from the flat many of the advantages of drawing from the round, the chief merit of which is that it compels the student to convey what he observes in his own language, so to speak, while in drawing from the flat, at least when copying drawings or lithographs, he is tempted to learn the stroke, to imitate the touch, and to produce as far as possible a *fac simile* of the original. But to produce a *fac simile* of a drawing is the last achievement of the most accomplished master, and to set beginners to this task, as is so often done, is mere cruelty. It



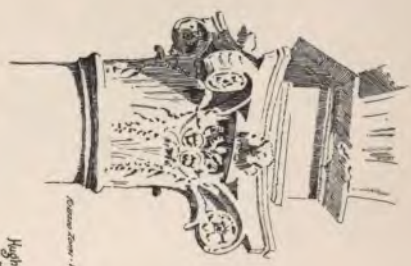
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from Owen portrait

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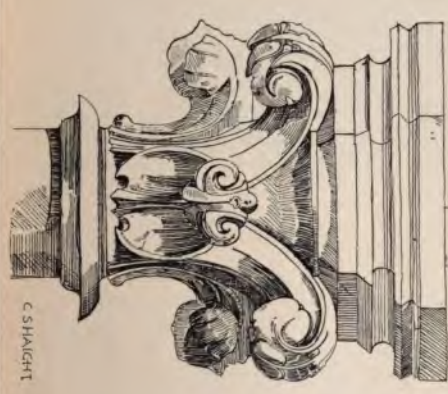


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Hugh P. Pilsbry
March 2, 1896



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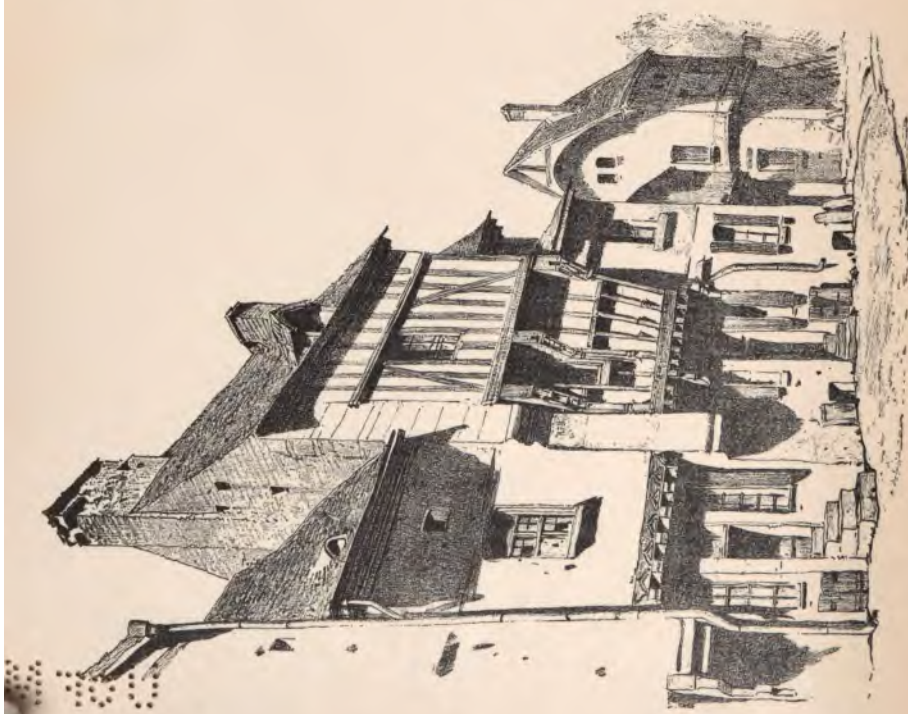


PLATE VIII. PEN-WORK FROM LITHOGRAPH BY CICÉRI. HALF-TIMBERED HOUSE.
(Reduced in scale about one-half.)

E. J. M.

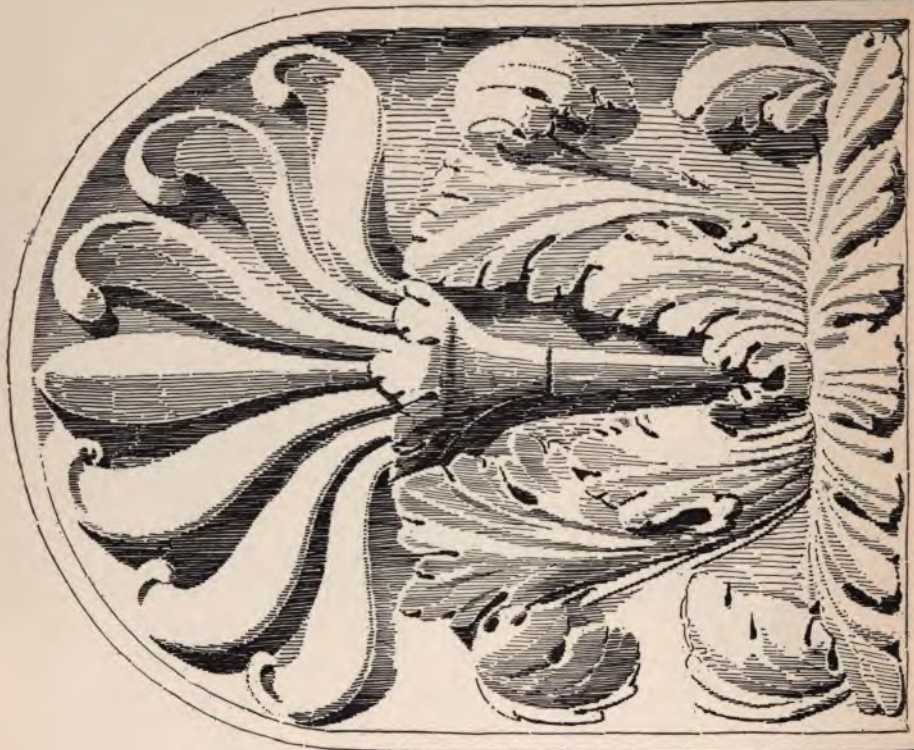
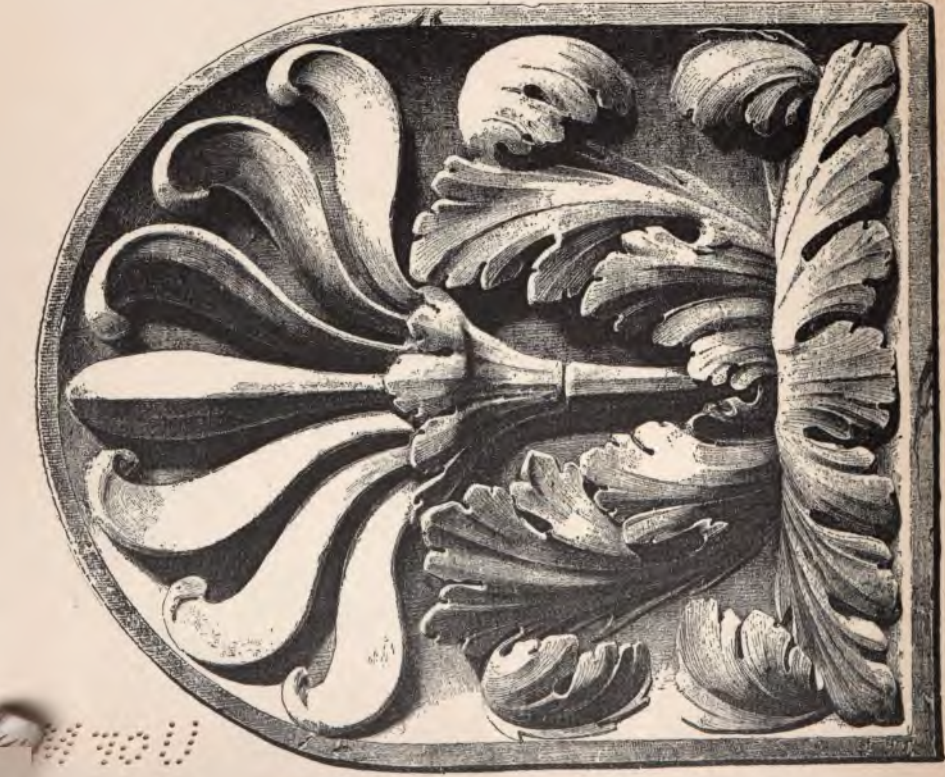
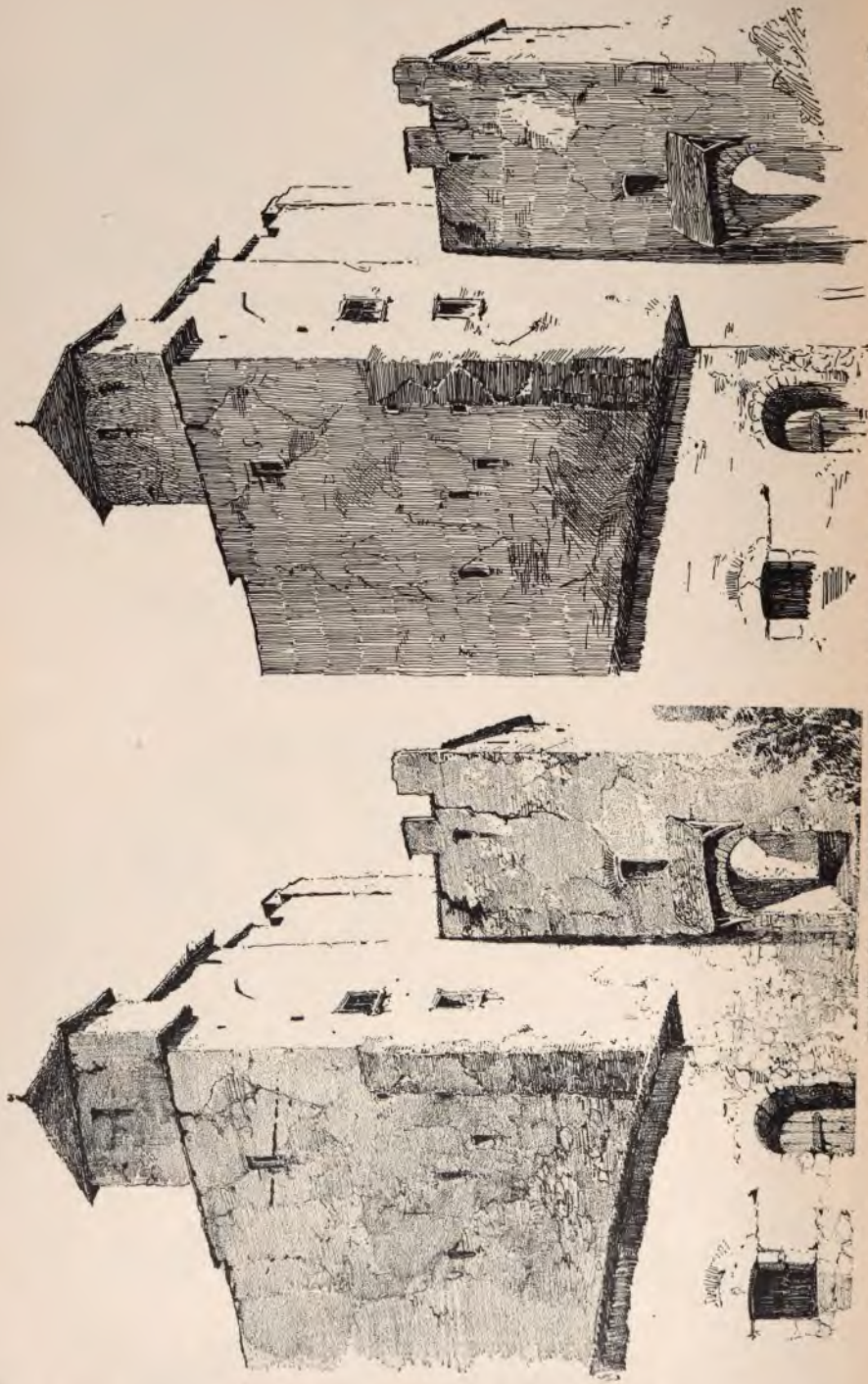


PLATE IX. PANEL FROM LITHOGRAPH BY PLANTAR. TERRA-COTTA ANTEFIX FROM THE VILLA PONIATOWSKI. H. D. B.
(The lithograph reduced about two-thirds, the drawing one-half.)



H. S. H.

PLATE X. PEN-WORK FROM A LITHOGRAPH BY CALAME.
(About one-half the dimensions of the originals.)

W



Voûture de la porte rouge. Notre-Dame de Paris.



Crochets de Corniche.

Notre-Dame de Paris.



PLATE XI. TOOTH-PICK WORK, ENLARGED FROM ENGRAVINGS
AND A PHOTOGRAPH.

J. C. K.

(Reduced about three-quarters, nearly to the size of the originals.)

condemns them in advance to failure and disappointment. Whatever the merit of their work, it is bound to be discredited by an inevitable lack of likeness. But in the method under consideration a *fac simile* is impossible; the work is mainly the student's own; whatever merit it possesses is manifest, and he gets the credit and the encouragement which his pains deserve. Drawing from the flat, whether from lithographs, prints or photographs, is thus made almost as improving as drawing from the round. For this the elaborate lithographic studies of ornament for crayon drawing afford excellent material. To translate them into so different a language, and at the same time to retain the main points of form and expression, is a liberal education in draughtsmanship. (Plates VIII. and IX.)

So simple and almost mechanical a method of shading would seem, of course, like the ruling in of skies in an engraving, to possess but little flexibility, and is hardly to be expected to lend itself to the expression of nice distinctions. It is interesting and rather surprising, accordingly, to notice what different results it produces in different hands, and how well it can simulate the touch and manner of different artists, fairly well reproducing, for example, the special quality of Calame's well known-studies, drawings which would seem to owe their special character to their own special medium and procedure. (Plate X.)

Much of this work is naturally done upon a small scale, and the drawings made from the cast, and from large lithographs and photographs, often show considerable reduction in size. But it often happens, especially in the drawings made during the weeks given to historical research, that the copies are larger than the originals, details of carving or sculpture being drawn out full-size from photographs or scale drawings, the enlargement being made either by the eye or by the process of squaring. These afford practice in a bolder manner of work. They are executed with charcoal, the brush or the pen. An admirable substitute for the pen is the wooden toothpick, which gives a soft even line hardly to be distinguished from that of the reed-pen. Any soft stick sharpened to a point, such as the wrong end of a penholder, answers of course just as well. (Plate XI.)

These manipulations have also a great advantage in respect of convenience and economy wherever, as is so often the case both at home and at school, a north light, a large room and a sufficient supply of plaster casts are difficult to command. In our own present

quarters, where there is no place suitable for drawing from the cast, it has enabled us to get along very comfortably with flat copies. But the trials we have made of it in drawing from the round, using such small casts as can be placed on the draughting-tables, have shown how sufficient it would be for larger work, and how especially rapid and effective it is in the delineation of architectural details. (Plate XII.)

The considerations that make this procedure so convenient for the draughting-room of an architectural school would make it, perhaps, as has already been said of tracing, an acceptable method of learning to draw in other schools, public or private. It is easy to learn, economical of time, and brilliant in its results, so much so indeed, that it seems almost like a trick to enable persons but little practiced in draughtsmanship to turn out fairly good work. But it exercises their intelligence, as well as their powers of observation, and while making a good return for a moderate amount of care and skill, it rewards abundantly the most generous outlay. Moreover, the manipulations are so simple as to make it unnecessary that the subject-matter should be simple too. It thus throws everything open to the beginner, and since, as has been pointed out, it tends to bring the use of flat copies once more into repute, it makes it possible to enlist in the task of learning to draw all the interest a student may have in any subject of any kind.

Practiced in this way drawing appears not only as a means of artistic culture, that is as a thing desirable in itself, but as means to an end, as a helpful instrument in the study of almost any subject that either pupil or teacher may care to take up. For draughtsmanship like language is of use for something besides the expression and communication of ideas. It is of great assistance in forming them, just as writing is a great help in sustained thinking. Writing serves not only to define our ideas but to fix them. It transmutes the passing thought into a permanent remembrance. *Scripta littera manet.* Observations require recording. Reasoning and inference need formulating. Here drawing answers the same purpose as writing. It is an invaluable addition to one's intellectual appliances, and it is because drawing may thus be made useful, not because it is the first step in the practice of the Fine Arts, that it deserves a place by the side of writing in schemes of general education. But the simpler the machinery and the more easily mastered, the more serviceable of course is the machine.

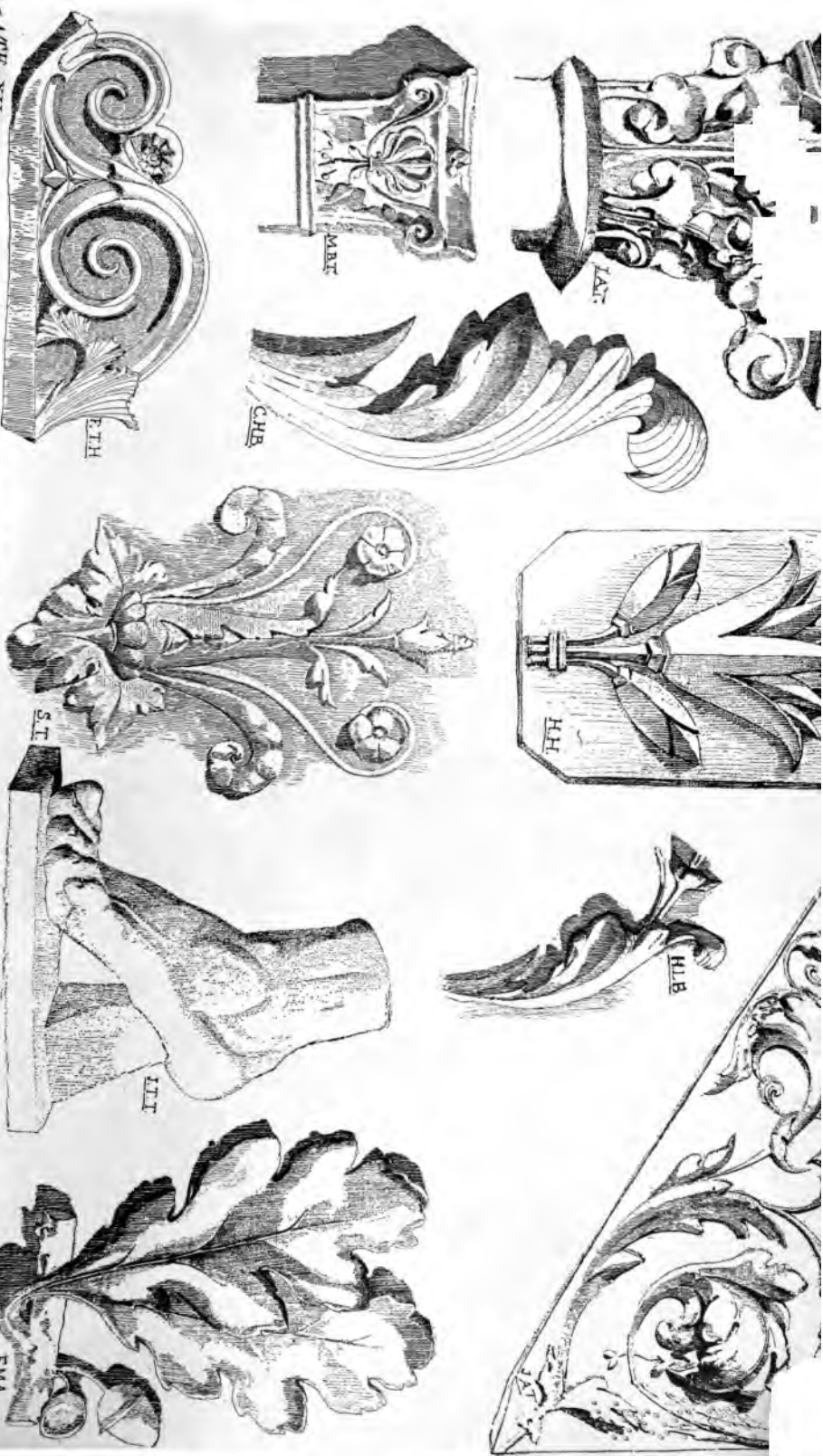


PLATE XII. PEN-WORK AND PENCIL-WORK FROM THE CAST. F. T. H., M. B. T., E. M. A., C. H. B., H. D. B., H. H., J. T. T., J. A. T., S. T.
 (Reduced in scale about three-quarters.)

450

Even where, as in our own case, drawing is taken up not only as an aid to accurate conception and expression, but as the medium by which art is to be studied, and artistic conceptions and artistic skill developed, these simple devices have a definite value, as has already been pointed out. They tend to direct attention to the masses rather than to details, to essentials rather than to particulars, to questions of artistic relation rather to difficulties of handling. Any schools accordingly which include the study of the Fine Arts in their course, as a branch of liberal culture, may perhaps find these methods as serviceable as we have found them ourselves.

III. GRAPHICAL CONSTRUCTION.

The painter, like the sculptor, employs in his composition natural forms, and the skilful and accurate representation of real objects is his main work. But the architect, like the musician, and like the potter, the weaver and other workers in the arts of design, himself creates the forms which he employs in his compositions, so that skill in representing what he sees is of less importance to him than the power to give shape to his own conceptions, to what is visible to the eye of his mind. We accompany these exercises in Tracing and Copying, accordingly, and employ the handiness they develop, by exercises in what, for lack of better names, we may call Graphical Construction and Graphical Discussion.

For these a few hours' preliminary discipline in drawing straight and curved lines, so that they shall be of even and uniform tenor, amply suffices. It is excellent practice to put down dots at random and to connect them by a firm and clear stroke, straight or curved. If the dots are set so that the result is a geometrical or decorative figure, or resembles a building, a vase, or any other object, so much the better.

Among the exercises given under this head are :

1. *A Diaper Pattern.* An oblong, about eight inches by twelve, is carefully laid out and each side divided into four parts. Then diagonals are drawn, cutting up the surface into diamonds, each side of which is then divided into three parts, and a right-angled triangle erected upon each middle part as a hypotenuse. This gives eight-pointed stars, alternating with pointed crosses. Each of these figures is then divided into eight or four parts by lines drawn across their centres, joining the opposite internal angles.



The pattern thus formed is sometimes shaded with parallel lines in one or two tints, according to each student's judgment or fancy.

This exercise gives capital practice in drawing straight lines long and short, and serves besides to illustrate two important points. The first is that, in any work containing several repetitions of the same figure, they should all be drawn, so to speak, *à la fois*. The pattern, as thus laid out, shows twelve stars and eight half-stars. If these twenty figures were taken in hand one by one, each being finished before the next was begun, the task would become tedious almost beyond endurance before its end was reached. Moreover, the last star would either be better done than the first, after all this practice, or worse done, through loss of interest and the weariness of the flesh. In either case the work would lack uniformity and one part would disparage the other.

This disparity is avoided if the twenty figures are made to advance simultaneously, *pari passu*, all the horizontal lines being put in first, then the vertical ones, then the inclined ones, those that are parallel to each other being taken together. If there is any loss or gain in point of execution it is thus spread over the whole drawing and does not show anywhere. Moreover, and this is the second point, the work becomes largely mechanical. It is chiefly the work of the hand and the nervous system. The eye and mind are hardly called upon. This is a great gain. The weariness that comes in drawing the same thing twenty times over is a mental fatigue. Each repetition involves a dozen readjustments of observation, intention and volition, and the spirit flags before the task is half accomplished. But if all the similar strokes are thus made at the same time, a single effort of eye and mind suffices for the whole. Pains is taken with the first, but all the rest do themselves. The strain upon the attention is relieved, and by the time the bottom of the drawing is reached one feels quite rested and is ready to start again.

The drawing of parallel lines, indeed, becomes in this case so automatic that I have often found this spontaneous work of the hand more accurate than that of the careful eye. The diagonal lines will run so true as to correct errors made in laying out the original points of division. One can, indeed, almost work with his eyes shut.

When the shading is completed it is instructive to notice how many different designs result, and how much simpler the pattern looks than when shown merely by the lines.

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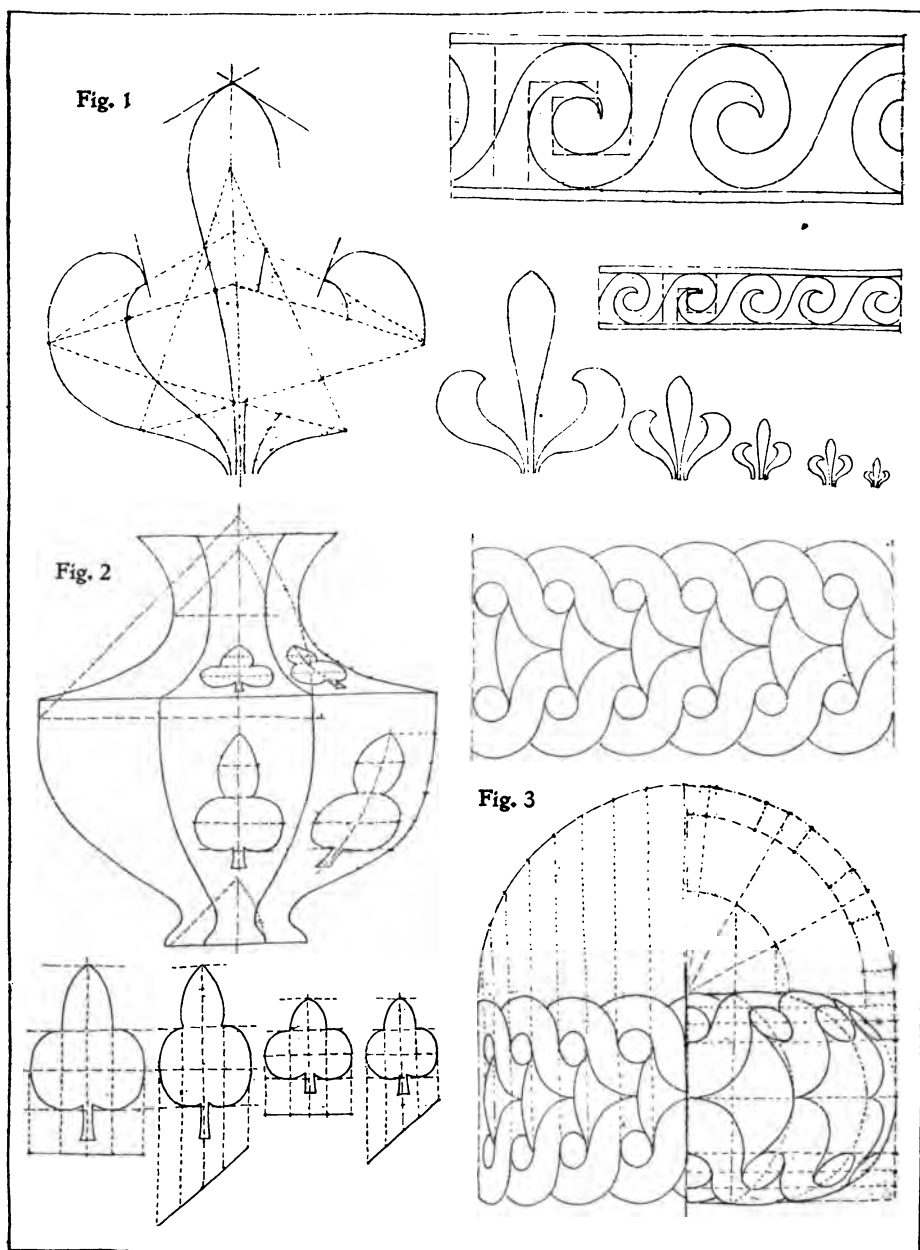


PLATE XIV. GRAPHICAL CONSTRUCTION. (*First Year.*) A. R., M. R. S.

Fig. 1. The Fleur de lys.

Fig. 2. The Octagonal Vase.

Fig. 3. The Guilloche.



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This principle of working all over the field at once applies, of course, to any case of uniform repetition, such as, for instance, a row of Corinthian capitals. It is almost impossible, otherwise, to make them look alike.

2, 3. Practice in drawing geometrical curves is found in drawing a sphere, with great circles and small circles upon its surface, projected as ellipses, and in making diaper patterns of intersecting and concentric circles. These and other patterns are, like the first, shaded in two or three flat tints with parallel lines.

4. *The Fleur-de-Lys*. The fourth example affords practice in drawing curved lines of a freer character. A rough sketch is made on the blackboard, and each student draws as graceful and well-proportioned a *fleur-de-lys* as he can devise, studying the form with tracing paper until it suits his taste, and then carefully drawing half of it. The rest of the work consists in repeating these lines, reversing them so as to complete the figure. (Plate XIV. Fig. 1.)

To this end, instead of using guide-lines as auxiliaries, as is often done, roughly conformed to the shape of the figure, we take a hint from the differential calculus and indicate the points of maxima and minima, the points of contrary flexure, and the terminal points, or cusps, noting in the last two the directions of the tangents to the curve and the points where these tangents would cut the central axis, if prolonged to meet it. At the maxima and minima points the tangents are either vertical or horizontal, and do not need to be indicated, these points sufficing to give both the position and the direction of the curve at its highest and lowest parts and at its extreme limits right and left. If now, the direction of these several points from each other is noted, two and two, and the point where a line joining them would cross the axis is also indicated, it is easy to find the position of the corresponding points on the other half of the figure. These points give the position and direction of both ends of each portion of the curve that lies between them, and it only remains to connect these points by lines of a proper character, circular, elliptical or hyperbolic.

If a number of such figures are to be drawn, they need to be drawn simultaneously, as has just been suggested for Corinthian capitals, to secure similarity of touch. But in this exercise we generally avoid the tedium of doing exactly the same thing three or four times over, and yet secure the advantage of going through the same motions three or four times, by repeating the figure on a

smaller scale. Each repetition takes less time than the last, and while rehearsing all that is most valuable in the experience, introduces a useful variety into the manipulations. It requires a nice touch to draw a *fleur-de-lys* only half an inch high.

5. *An Octagonal Vase.* Here also the form of the subject is left to each student's taste and fancy. The outline of one side of the vase being determined, and its width, that is to say the position of its central axis, the outline of the other side is found as in the previous exercise. Points on one of the front corners of the octagon are then found for each different diameter by drawing a line at 45° from one extremity of the diameter to the axis and revolving it down. One of the corners may then be drawn through these points and the other copied from it. This is an admirable exercise in freehand projection. (Plate XIV. Fig. 2.)

6. *A Guilloche.* This is drawn as a flat pattern, either single and double, and then again foreshortened, as if applied to a cylinder or torus. (Plate XIV. Fig. 3.)

7. *Leaves.* A plain leaf, drawn in three elevations, front, side, and at 45° , first flat, and then with the point bent over, is an excellent introduction to the study of the acanthus leaf in similar aspects. This prepares the way for the study of the Corinthian modillion, and this for the Ionic and Corinthian capitals.

In all these cases no copy is set, but a rough indication is given on the blackboard showing the kind of thing to be done. Everybody's interpretation differs, of course, from everyone else's.

The elementary principles upon which this work depends are simultaneously taken up in a mere formal manner in the course in Projections, and are further illustrated and applied in the study of Shades and Shadows. Since architectural forms are for the most part made up of regular geometrical solids, such as cylinders, cones and parallelopipeds, and since the light is, in an architectural drawing, supposed always to have the same direction, and the Shadows are generally supposed to fall upon vertical surfaces, it follows that the number of different shaped shadows that occur in practice is more limited than might be supposed. The same forms are constantly recurring, just as in multiplication the same factors are constantly furnishing the same products. Now just as, in arithmetic, it is worth while to tabulate these results and to learn the multiplication table by heart, so here it is a convenience to frame rules for these shadows, so that they may be drawn whenever

they occur by memory. We find it in fact almost as easy to make rules for the shapes of the shadows as for the shape of the columns and entablatures themselves, and they are as easy to learn as to make. These rules transfer the subject of Shades and Shadows from the field of geometry to that of draughtsmanship and enable a student to put them into his work as readily as the forms that cast them. The forms of both substance and shadow thus become so familiar that only care and attention are needed in drawing them, not computations and reasonings.

These exercises excellently exemplify the kind of drawing which is specially characteristic of the Architect. Every line, though executed with the free hand, is determined in shape, size and position by geometrical considerations. Thoughtless and careless work is out of the question. Draughtsmanship of this sort is an intellectual exercise. It has an educational value quite apart from its practical uses.

The habit of thinking with the pencil in hand which these exercises tend to foster, and of giving to every form as it presents itself to the imagination a concrete existence, is indeed a habit eminently conducive to clear and consistent thinking on every subject into the conception of which the idea of space naturally enters. Even in Geometry, Analytical Geometry, and the Calculus, students and teachers are much in the habit of saving themselves the trouble making drawings and of relying upon the vague images formed in their minds by a not too representative imagination. In Mechanics especially there is a particular advantage to clear thinking in substituting the forms of things for names. But even in Arithmetic and Algebra the relations of abstract quantities, too often hidden behind the apparently perspicuous grammar of the phrases in which they are stated, may be made surprisingly obvious if translated into the language of form.

IV. GRAPHICAL DISCUSSION.

The next procedure has still more distinctly an educational and disciplinary character, inasmuch as it exacts, besides accuracy of hand and eye, a still larger measure of mental activity. It consists of a series of exercises in which the object drawn is depicted in every variety of aspect, a simple barn or dog kennel, for instance, which is the object generally chosen to begin with, being shown in plan, with three elevations, two sections, a plan of the

roof, a perspective plan, a perspective view and a bird's-eye view ; ten sketches in all, all with the shadows cast. After two or three of them are drawn it is easy enough to do the rest. The labor of understanding the forms is at a minimum, but to maintain consistency of size and proportion among them all requires a constant observance of their relations. (Plate XV.)

The exercises under this head begin with simple forms, such as a barn, pyramid, or other geometrical solid, and go on to steps, chimneys, belfries, towers and spires, and finally to buildings and parts of buildings of any degree of complexity. Their value as affording practice in thinking in three dimensions, in conceiving an object in the solid, and distinctly apprehending its various aspects, will readily be understood by any one who knows how difficult it is for many persons to exercise their minds in space. They not only cultivate the imagination, however, but, by affording a complete graphical discussion of every object taken up, tend to form a habit of thorough and exhaustive investigation which is of real educational value. It is largely because the Classical Languages and Mathematics and the Natural Sciences afford examples of exhaustive discussion that these studies are accorded the place they hold in general education. An exhaustive graphical treatment of any object is not less exemplary, and for the student of Architecture it can hardly fail to be of special and immediate service. A designer trained in this discipline is hardly likely to rest content unless he knows how the back or side of his building is going to look, and is likely to feel uncomfortable unless he can see, in his mind's eye at least, how his roofs are going to go.

Meanwhile the student is obtaining much valuable experience ; his knowledge and comprehension of form is enlarged, and the phenomena of Projections, Shades and Shadows, and Perspective, become so familiar through mere use and observation that when these subjects come to be systematically studied he finds himself upon familiar ground. Being already accustomed to the facts he finds it comparatively easy to comprehend the laws that they illustrate.

The extension of these discussions to the study of whole buildings, upon a small scale, easily follows, and forms an instructive experience in planning and in the composition of masses. (Plate XVI.)

After one or two plates have been traced or copied so that the method may explain itself, it suffices to give the student two or

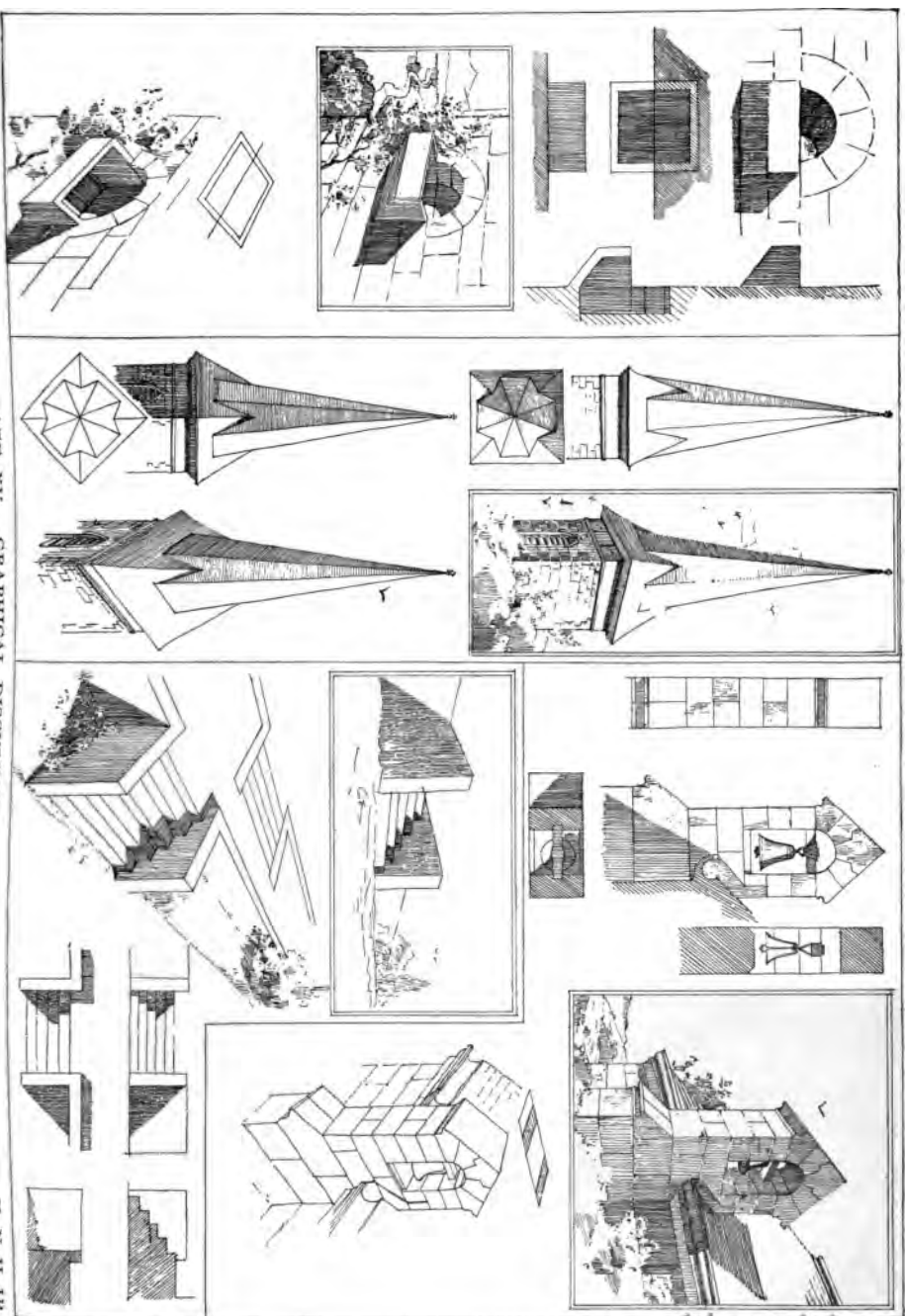
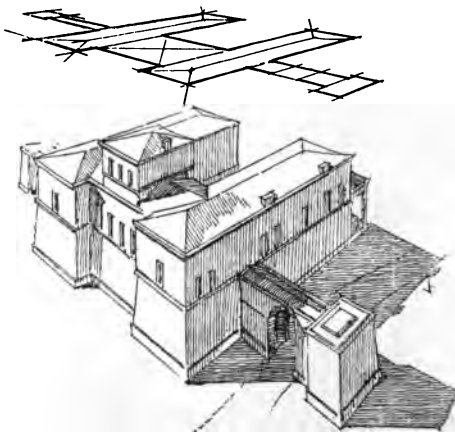
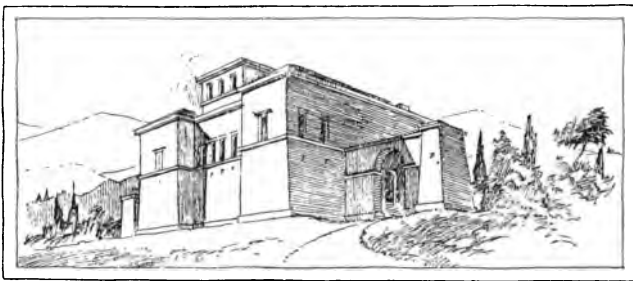
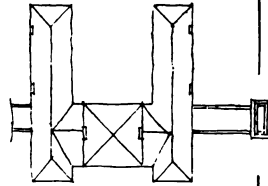
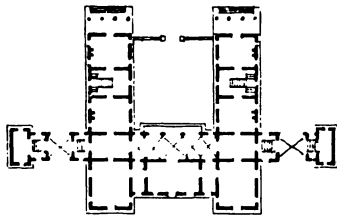
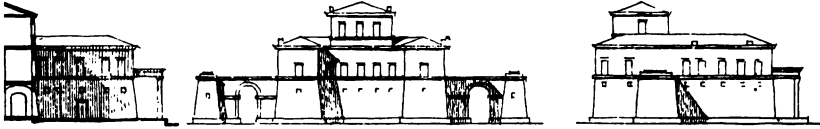


PLATE XV. GRAPHICAL DISCUSSION. (First Year.) W. F. B., C. A. H., H. N. H., JR.

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PLATE XVI. GRAPHICAL DISCUSSION. (First Year.)
(Plan and elevation given. The rest inferred.)

W. F. B.

YOU

three sketches, showing the object in two or three aspects. These are enough to start with. He then works out the other half dozen drawings for himself, inferring what can be inferred from the data furnished, and supplying the rest from his reason and imagination, or from the memory of previous studies.

By including in the series the details of the classical orders these forms also are made familiar. The student becomes acquainted with them in themselves, as works of art, in advance of taking them up scientifically and learning their numerical proportions. The numerical relations of these parts are indeed important and necessary to know. But this knowledge should come merely as an auxiliary and as a safeguard against error, after acquaintance has been made with the forms themselves and the student has learned to draw them from memory and to care for them for their own sake.

V. BRUSH WORK.

These exercises in Tracing, Copying, Graphical Construction and Graphical Discussion, executed for the most part with the pencil or pen, occupy rather more than half the time given to drawing during the first year, three or four hours in the morning being devoted to them every week and three hours in the afternoon every alternate week. One afternoon a week is given to them in the second year, and in the third year an hour or two a week is given to pen drawing. The historical drawing done in the second and third years, in illustration of the work of Historical Research which occupies the chief part of the spring, suffices to keep up and further to perfect the skill thus acquired.

The afternoons of the alternate weeks during the first year are given to Brush Work with India ink and colors, the intermediate weeks, as has just been said, being given to Pencil Work. These exercises amount to a dozen or twenty in number, being about one for each week devoted to them, and are arranged so as to give a considerable variety of practice in the rendering of plans, elevations and details. The series of exercises for the last year was as follows:

1. Practice Sheet of India Ink Washes.
2. Large Porch with Steps, from Durand, in color, with the shadows cast.
3. Elevation from Scheult's *Recueil d' Architecture*. This is a

collection of Italian villas, farm-houses, houses, granaries, fountains, etc., drawn in outline with an indication of background and foreground. They measure only three or four inches, but are enlarged by the students to twice or thrice their original dimensions, the shadows cast, and walls, roofs, sky, trees, hills and foreground put in in color, each student taking a different example. (Plate XVII.)

4. The Tomb of Scipio Barbatus, rendered in India Ink.

5. A Modern Cottage.

This serves to explain constructions in wood. Plan, section and details are traced from a diagram, and then re-drawn to a different scale and rendered in color.

6. A Stone Portico.

This is a similar exercise for constructions in stone.

7. A Tower. Elevation and Perspective.

This subject is given in plan and elevation by a diagram, drawn out by each student from his own sketch, with the aid of a little elementary instruction in perspective, and rendered in color.

8. A Figure in Flat Washes.

This is an exercise in drawing sculpture as it needs to be drawn in connection with architecture. A figure is traced from a print or photograph, the main line dividing the light side from the dark side is found, and the dark side shaded with a single flat tint. The figure is then reduced in size several times by the method of squaring, until the smallest drawing is about as large as the figures of statues introduced into drawings of buildings. Each student draws a different figure. (Plate III.)

9. Another example from Scheult, with the plan and ornamental grounds added. (A side elevation, also, such as may easily be inferred from the other, is sometimes required).

10. The Tuscan Order, at a two-inch scale.

11. The Doric Order, at a one-inch scale, applied to a doorway. (Plate XVIII.)

12. The Ionic Order, at a three-inch scale.

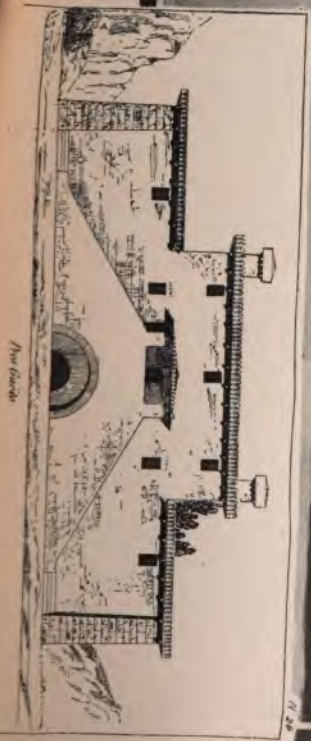
13. The Corinthian Order.

The class had not yet learned their Orders, and these plates were made merely as drawing exercises. But they had by this time learned their Shades and Shadows, and the shadows were accurately cast, rendered in India ink, and the plates colored.

14. A large plan, with gardens, rendered in color.

15. A large elevation, rendered in color with the shadows cast.

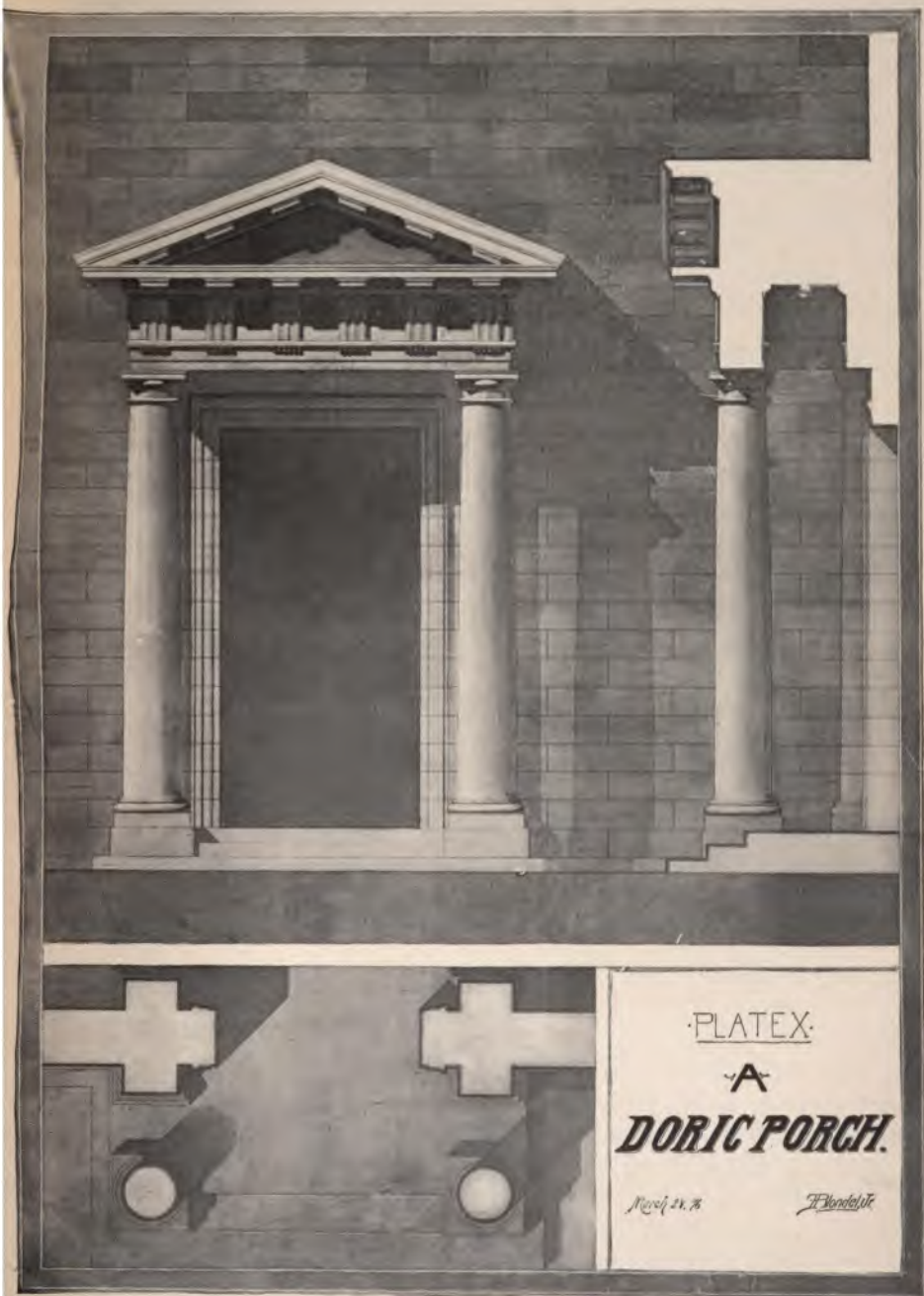
PLATE XVII. FROM SCHEULT'S RECUEIL. ENLARGED AND
 COLORED. (First Year.)
 H. C.



First Year



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PLATEX.
A
DORIC PORCH.

Nov 21. 78

J. H. H. H.

PLATE XVIII. A DORIC PORCH.

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By this time the class had learned their orders.

The exercises in historical drawing which occur in the last half of the second and third years afford opportunity for further practice with the brush both with color and with India ink, and this is made the most of. But of course the chief application and development of the skill attained by the elementary exercises of the first year is found in the rendering of the plans, elevations and details, the study and designing of which is the chief work of the second, third and fourth years.

In the fourth year also, the class have regular instruction and practice in water colors, and in the drawing and rendering of architectural perspectives. The skill thus gained is turned to account in rendering ornament with the brush, instead, as before, with pencil, pen and charcoal.

It is an interesting variation of these exercises to copy in water colors a picture painted in oils, or to copy a photograph or engraving, imitating the handling and coloring of a water-color drawing of similar character, as is done in the plates from Scheult. Plate XVII. The inverse process, that of copying in India ink or sepia, or with the pencil or pen, drawings or paintings in color, is even more instructive, since it involves a solution of the difficult problem of rendering the relations of colors, and their *values*, by means of black, white and gray. All these exercises tax to the utmost the student's judgment and skill, and often bear witness in the result to interesting diversities of personal predilection. Like the drawings made in copying photographs or lithographs, these are exercises rather of translation and interpretation than of direct imitation, and like them are a capital preparation for drawing from nature.

These works of various draughtsmanship illustrate, indeed, in a marked degree, the principle which guides and governs all the work of the school, in every branch of study, the principle of defining the student's work within strict limits, so as to make sure that he traverses every portion of the ground that he is required to go over, but within those limits not only permitting, but obliging him to think for himself, try his own experiments and trust to his own wits in shaping his answer to the questions that present themselves. Even in the Mathematics and Mechanics every fresh point is presented by preference as a problem to be solved rather than as a theorem to be demonstrated. As was said of

24 *INSTRUCTION IN ARCHITECTURAL DRAWING*

the historical problems described in a previous paper, if the student can find an answer for himself he had better do so. If he cannot, the attempt makes the answer more intelligible and more welcome when it is told him. So in this work with pen, pencil and brush the student is shown just what he is to do, and the principles he is to follow are explained to him. But in the application of them he is left largely to his own devices.

VI. OUTDOOR SKETCHING.

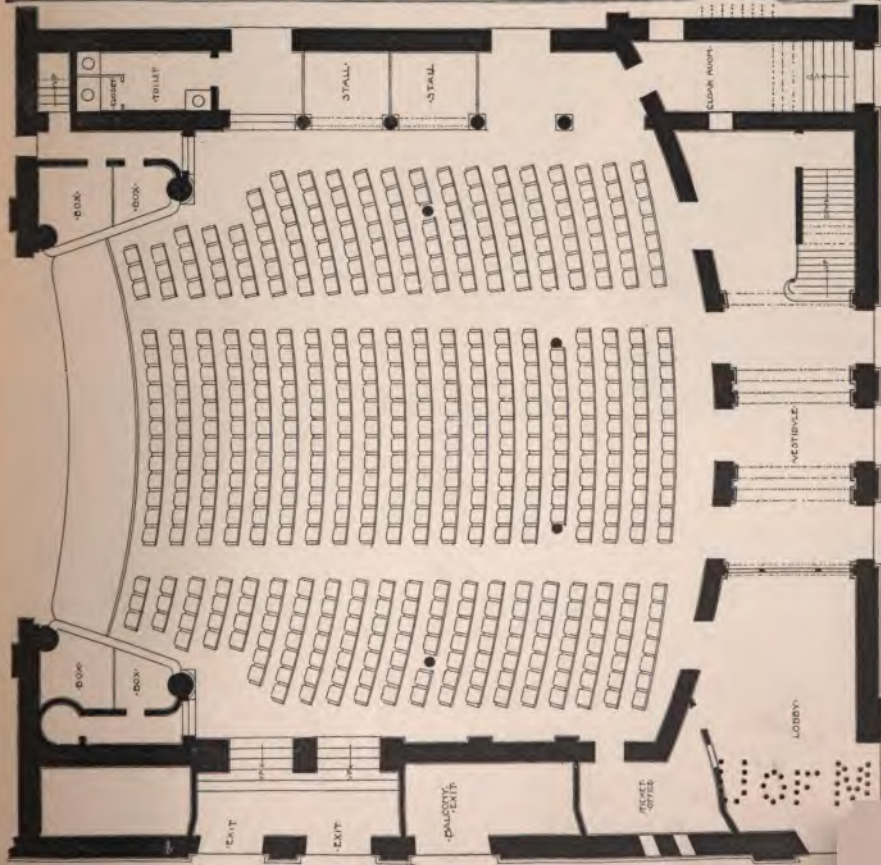
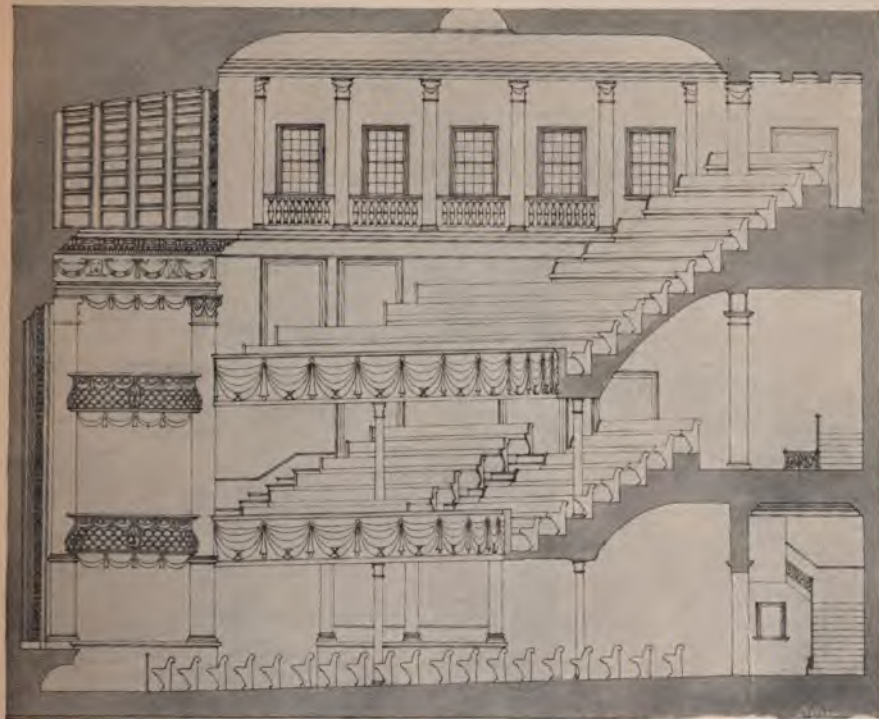
All the men in the three upper classes study buildings in the city and make from them measured sketches during the first four or five weeks of the year. This is of great service in helping them to understand and feel the relations that exist between drawings and the things they represent. Similar exercises form a portion of the work required to be done during the three summer vacations.

In the prosecution of this work two squads, of about twenty men each, last year attacked the City Hall and Trinity Church and, by the favor of the Mayor and of the Wardens, were enabled to make fairly complete drawings of both those buildings. This year a still larger number of men, organized in squads of three, each under the captaincy of a fourth-year man, made measured drawings of a large number of buildings and parts of buildings, public and private, a work for which their owners kindly offered every facility. (Plates XIX. and XX.)

VII. THE ORDERS.

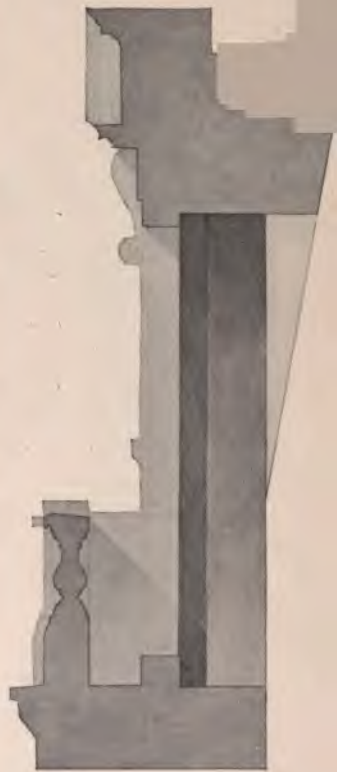
In all this work the objects drawn are mainly of an architectural character. Even the purely geometrical figures are the elements out of which architectural details are composed; the vases, foliage and flowers are either themselves examples of architectural ornament, or are the originals which have suggested it; and the same may be said even of the studies in sculpture and the human figure.

These exercises, including, as they do, the drawings made in connection with the study of history, make the men fairly familiar with most of the more common architectural forms. But there is a certain class of architectural details which, not only from their unique position, both in the history and in the practice of the art, but also from their intrinsic quality, require a closer study. The Greek and Roman columns and entablatures, and the



— ORCHESTRA FLOOR PLAN —

7700



DORMER WINDOW
RESIDENCE OF HTSLOANE

Measured and Drawn by
K.L. Caswell

PLATE XX. MEASURED WORK. *(Second Year.)*

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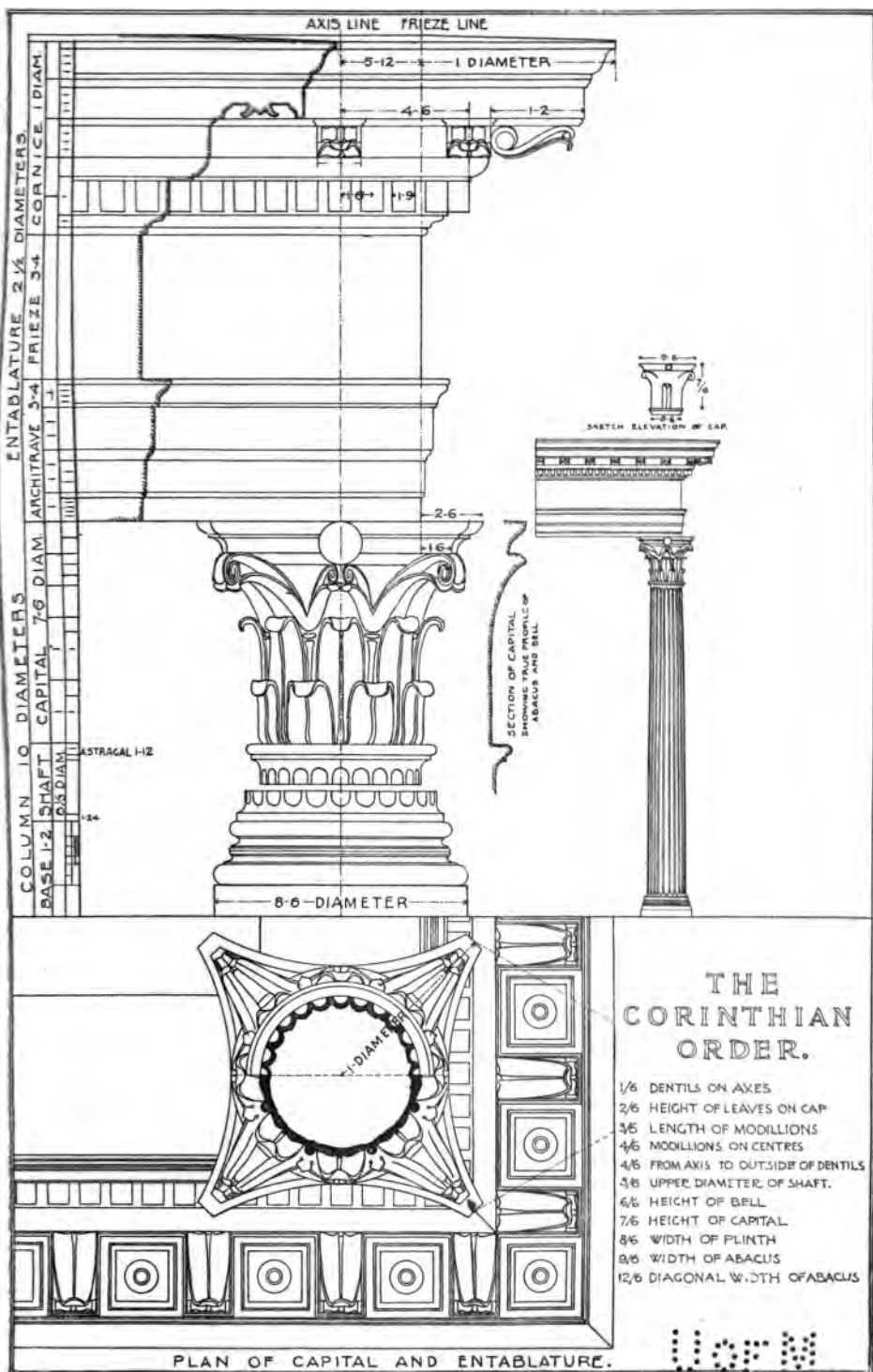


PLATE XXI. DIAGRAM OF THE CORINTHIAN ORDER.

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forms of doors, windows and other features, which, in earlier or later times have been devised to accompany them, are at once the final fruit of all the Egyptian and Oriental art that comes before them and the source and inspiration of all the mediæval and modern architecture that has followed. They form, moreover, at the present day, the habitual medium of architectural expression in every civilized country.

To learn to employ the Orders in architectural compositions is a part of the study of design. But the study of these elements of design themselves is a branch of architectural drawing and comes properly within the subject of this paper. The experiments and criticisms, the variations and selections, of two thousand years, while they have evolved a great number of species, so to speak, of this genus, have, as in the natural world, determined the limits of profitable variation in each within narrow bounds, so that it is possible to define what may be called their normal types with something of geometrical and even of arithmetical precision. With these types it is necessary that the architectural student should become perfectly familiar, so that he may employ them in his thinking and in his drawing with as little hesitation as he employs his multiplication table, or the vocabulary of daily conversation.

The task proves, happily, on investigation, to be less formidable than might be thought. Their very universality makes these forms familiar to the eye, and it is almost as easy to learn how they go as to learn a popular tune. Their quantitative determination, so as to get them just right, is more difficult, and is rendered particularly so by the cumbrous systems of modules and minutes which the text-books, from the time of Alberti and Vignola, have employed. A little study, however, shows that the use of a scale of parts, which are according to Vignola twenty-fourths or thirty-sixths of a diameter, and according to other authorities sixtieths, is quite unnecessary. It is perfectly practicable to define all the dimensions which it is important to define at all, in terms of the sixth part of a diameter, for all the Orders. The diagrams which illustrate these results are made accessible to the students by means of *blue-prints*. (Plate XXI.)

This study, under the name of the Elements of Architecture, is taken up in the middle of the first year, and is expanded so as to include the discussion of such features as staircases, arcades, vaults,

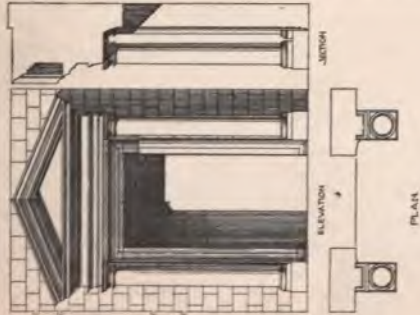
domes and spires. Formerly we began this arithmetical study of the Orders at an earlier moment. But it proved to be a mistake to approach the subject on this side. It was like making the acquaintance of flowers through a botanical dictionary instead of in a garden. The students, we found, were prone to regard these masterpieces of art, not as graceful and beautiful, but as containing so many sixths. We now, as has been said, begin with them as works of art, drawing and sketching them for their own sakes. By the time these rules are given out the capitals and cornices have become familiar objects, and statistical information in regard to them comes as a felt want, and, satisfying a legitimate curiosity, is easily remembered.

Meantime the study of Projections and of Shades and Shadows, which, along with Perspective, Descriptive Geometry and Stereotomy, belong rather to the subject of Graphics than to architectural drawing, is taken up in the first half of the year, and prepares the way for this more scientific treatment of the Orders. It is accordingly practicable to teach not only the forms of these details and the simplest way of drawing them out, but, as has already been said, the shapes of the shades that occur upon them and of the shadows which they cast. For, as the light is supposed always to fall in the same direction, these shapes are always the same. This is a great help toward a draughtsmanship which is at once scholarly and rapid.

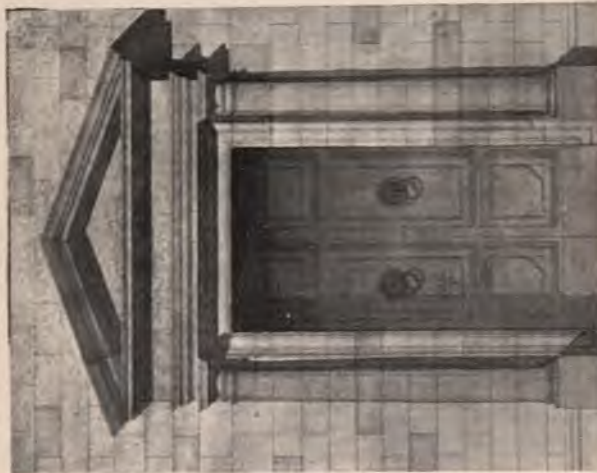
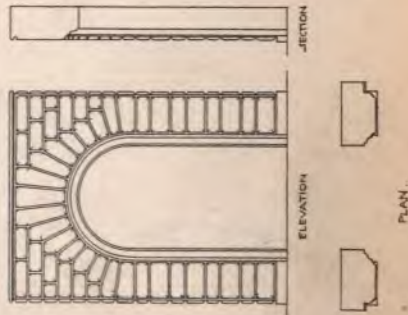
To clinch the nail that has thus been driven, and to make sure that the men shall not forget what they have just learned, the work in free-hand drawing is turned into this channel, the class taking photographs or engravings of buildings or parts of buildings in which the Orders occur and sketching them in various aspects.

In the second year the drawings made in the second term are mainly in illustration of the historical studies, modern or mediæval. But in the first term the time is given partly to work in design and partly to a systematic preparation for it which may properly count as exercises in architectural draughtsmanship. To pass at once from the study of the Orders to problems in the designing of buildings, has proved too long a step for men to take without more constant personal supervision than we can offer. For the last two years these disciplinary studies have accordingly been introduced, and the drawing of doors, windows, pavilions, external and internal wall treatment, etc., is prepared for by a detailed

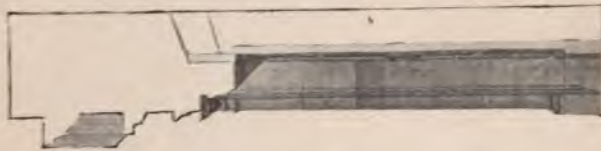
FROM THE "BARTOLINI" PALACE
ELEVATION, SECTION, PLAN AND DETAIL



FROM "FARNESI" PALACE



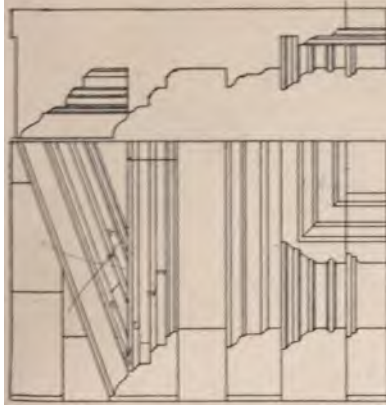
Door of the Bartolomeo Eusebio Entrance.



SECTION

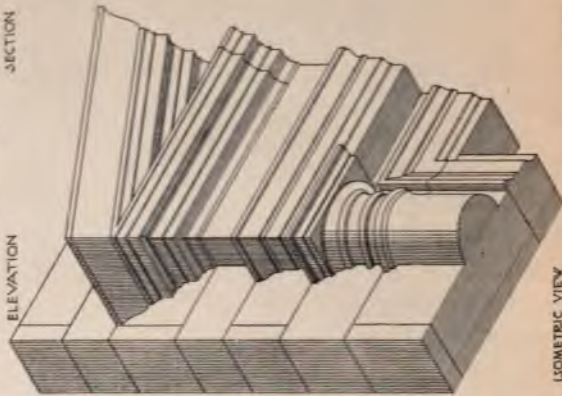


PLAN.



ELEVATION

SECTION



ISOMETRIC VIEW

study of each of these features in plan, section and elevation. (Plate XXII.) This is equally serviceable for the study that it immediately leads to, for the problems in the designing of structures that begin in the third year, and for the historical studies and the work in Historical Design which in both the second and third years occupy the chief part of the spring.

In all this work of tracing and copying, of reasoned construction, of interpretation, inference, and imaginative creation, the special needs of a school of architecture justify a special procedure. It is the distinction and privilege of the student of architecture that his work from the very beginning is controlled by the same considerations which are ultimately to govern him in the larger fields of architectural composition. For the elementary forms which enter into the composition of buildings are themselves of man's device, embodying and illustrating all the fundamental principles of the art. While the painter and the sculptor, who work with natural forms, have to defer the study of composition, which is in all the arts the ultimate artistic endeavor, until a sufficient knowledge of natural forms and skill in the representation of them have been acquired, the student of architecture may practice his inventive and creative faculties from the outset. It is the aim of the exercises described in this paper, accordingly, to train these faculties, and in so doing to develop the imagination, to encourage independent thinking, and to promote not only a working familiarity with the accepted historical forms and the geometrical elements that enter into them, but an intelligent understanding of them in all their relations.

Drawings and Designs

Made by the Students in the School of Architecture during
the Year Beginning October 1, 1895, and
Ending June 1, 1896.

First Year Work.

- I. Sketches and Tracings made in illustration of the Study of Ancient Architectural History.
Tracings of Ornament with the brush.
Restorations of an *Egyptian Palace*.
Restorations of the *Hanging Gardens of Babylon*.
- II. Free-hand Drawing. Outline. Shading. Ornament.
- III. Every-day sketches.
- IV. Brush Work. 15 Plates.
 1. India ink Washes.
 2. Porch and Doorway.
 3. Monument.
 4. Plate from *Scheult*, enlarged and colored.
 5. Tomb, copy.
 6. Flat-wash Figure.
 7. From *Scheult*.
 8. Tower, from Perspective Sketch.
 9. Tuscan Order, from Description.
 10. Doric Porch.
 11. Ionic Column and Shadow.
 12. Bath House, dictated.
 13. Temple Tomb, dictated.
 14. Villa Capra.
 15. Rendered Drawings, from Drawings, Photographs and Prints.
- V. Elementary Design, partly from Description.
 1. Bracket, Post and Wall, Rusticated Arch, Iron Grilles, Vases, Diaper Pattern, Baluster and Rail, Chamfers, Doors, Broach Spire, Hospital.
 2. Renaissance Capitals, drawn from descriptions of photographs written by the class, and interchanged.
- VI. Examination Paper. Pattern with *Fleur-de-lys*.
- VII. Graphical Construction.
 1. Diaper Pattern, Interlacing Circles, *Fleur-de-lys*, Guilloche, Wave Pattern.
 2. Tuscan, Doric and Ionic Capitals, Entablatures and Pediments, in plan, elevation and isometric projection.

- VIII. Graphical Discussion.
Barn, Belfry, Dome, Villas.
- IX. Time Sketches.
Exercises with the Orders, Colonnades and Arcades.
- X. Graphics.
Projections, Shades and Shadows.
- XI. The Elements of Architecture.
The Orders, Staircases, Balustrades, Arches, Vaults, Domes, Roofs,
Spires, Pediments, Pedestals, Pilasters.

Second Year Work.

- I. Elementary Composition.
 - 1. Elements of Doors and Windows.
 - 2. Rendered Drawing of an historical example, or a design, for a Door or Window.
 - 3. Detail of Plate 2.
 - 4. Elements of Wall Treatment.
 - 5. Detail of Plate 4.
 - 6. Elements of Planning.

Use of External and Internal Orders, with Application to Doors and Windows.

 - 7. Elements of Planning.
 - Study of Mass and Sections.
 - 8. Design. *A Mausoleum, A Chapel, The Façade of a Church.*

The Renaissance forms studied during the work in Historical Research are here applied to definite problems. That of the *Façade of a Church* is a project for the completion for the front of the Church of San Lorenzo, in Florence, in a style assigned to each Student.
- II. Every-day Sketches.
- III. Construction. Problem of Plumbing.

Third Year Work.

- I. Problems of Design.
 - 1. A Hall for Antique Sculpture.
 - 2. A Mausoleum.
 - 3. A Two-storied Façade.
 - 4. A Pavilion or Café in Park.
 - 5. A Monumental Arch on a Bridge, serving as Entrance to a Public Park.
 - 6. A City Market and Clock Tower.
 - 7. A Public School for three grades.

30 INSTRUCTION IN ARCHITECTURAL DRAWING

- II. Construction Problem.
A Bicycle School. Plan, Section, Elevation, Engineering Plates.
- III. Free-hand Drawings.
Pen drawings from Photographs, and from Water Colors and colored lithographs.

Second and Third Year Work.

HISTORICAL RESEARCH.

- I. Sketches and Tracings made in illustration of Modern Architectural History.
Six weeks in March and April are given to this work, the classes being divided into six sections, which take up in turn the subjects named in the following groups. Each student writes a report of his week's work.

Group 1. Palaces.	Group 4. The Orders.
Group 2. Churches.	Group 5. Vaults and Ceilings.
Group 3. Composition of Façades.	Group 6. Architecture of the XIXth Century.
- II. Drawings from descriptions written by Students of the Second and Third Classes, and Interchanged.
- III. Studies in Historic Styles (6-hour Sketches).
 - 1. Two Doorways in different Renaissance styles.
 - 2. Façades of a Palace.

MEASURED WORK.

Drawings from measurements and sketches made by Second, Third and Fourth Year Men in October, 1895.

- 1. *The Bowery Savings Bank.*
Elevation.
Detail of Entrance Door.
Detail of Window.
Section.
- 2. *The Greenwich Savings Bank.*
Side Elevation.
Detail of Side Elevation.
Central Window, Side Elevation.
- 3. *The 71st Regiment Armory.*
Plan.
West Elevation.
Detail of Entrance.

4. *The Garden Theatre.*
Ground Floor Plan.
Gallery Floor Plan.
Section.
5. *Abbey's Theatre.*
Detail, Chandelier.
Detail, Boxes.
6. *Residence, 41st Street and Madison Avenue.*
Details of Window.
Bay.
Second-story Window.
Front Elevation.
7. *Mr. H. T. Sloane's House.*
Dormer Window.
First-story Window.
8. *Mr. Taylor's House.*
Second-story Window.
Third-story Window.
Entrance Door.
9. *Mr. Hoe's House.*
Front Elevation.
10. *The Metropolitan Club.*
Entrance Court Yard. Plan.
Entrance Gates.

Fourth Year Work.

- I. Plates of Descriptive Geometry and Stereotomy.
- II. Water-color studies. Skies, Flat-wash Trees, Belfries, Chimneys, Landscape, Tower,
- III. Figures from the flat.
- IV. Problems in Design.
 1. A College Library.
 2. A Museum of Sculpture and Painting.
 3. A Building for the Lecture Hall and Class Rooms of a Theological Seminary.
 4. A Staircase in a Public Building.
 5. A City House (Sketch).
 6. An Interstate Exhibition Building.
 7. A Monumental Arch on a Bridge, serving as Entrance to a Public Park. (Examination Sketch.)

